We claim:

1. A method for monitoring the processing of semiconductor wafers, wherein the processing creates one or more geometrical features on the surface of the wafer having at least one dimension significantly less than a micron, said method comprising the steps of:

focusing a coherent probe beam of radiation to a spot overlapping the feature on the sample surface in a manner so that the rays within the probe beam create a spread of angles of incidence and wherein the spot size on the sample is on the order of one micron in diameter so that the probe beam is diffracted upon reflection;

monitoring the diffracted probe beam light and simultaneously generating a plurality of independent output signals corresponding to a plurality of different angles of incidence; and

comparing the output signals to an expected set of signals to determine if the process is within a specified tolerance.

2. A method as recited in claim 1, wherein said process is terminated if the output signals are outside said specified tolerance.

3. A method as recited in claim 1, wherein said probe beam is focused onto the sample while the sample is in situ.

4. A method as recited in claim 1, wherein the probe beam is generated by a laser.

5. A method as recited in claim 1, wherein the probe beam is passed through an analyzer and wherein the change in polarization state of the rays within the probe beam are monitored.

6. A method as recited in claim 1, wherein the expected set of signals are generated based on a theoretical profile of the feature and wherein after the comparison step, another set of expected signals are generated based on the results of the comparison using a different theoretical profile of the feature and wherein the comparison and generation steps are repeated until the differences between the expected set of signals and the output signals are minimized.

7. A method as recited in claim 1, wherein the during the comparison step, the output signals are compared to a set of previously generated theoretical expected signals to find the closest match and wherein each one of the set of previously generated expected signals corresponds to a different possible geometry of the feature.